

REMARKS

Claims 1-48 are pending in the application. Applicants appreciate the Examiner's indication of allowable subject matter in claims 4-11, 13, 14, 16, 18, 19, 24-26, 28-34, 36-38, 40, 41, 47 and 48. Applicants also appreciate the Examiner's consideration, and making a record, of documents submitted in an Information Disclosure Statement (IDS).

The drawings were objected to for not illustrating features of the invention as specified in the claims - more specifically, the turbo encoders as recited in claims 16 and 38 are indicated as not being illustrated. Multiple encoders are illustrated in Figures 3-5 as elements 330, 340, 430, 440, 530 and 540 respectively. Applicants respectfully request withdrawal of this objection.

Claim 26 was objected for improper dependency - claim 26 has been amended as suggested by the Examiner.

Claims 1-3, 15, 17, 20-23, 27, 39 and 42-45 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,671,327 ("Jin") in view of U.S. Patent No. 5,233,629 ("Paik"). Claims 12 and 35 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jin and Paik and further in view of in view of U.S. Patent No. 6,553,539 ("Markarian"). Claims 24 and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jin and Paik and in further in view of U.S. Patent No. 6,088,387 ("Gelbaum"). Applicants respectfully request withdrawal of these rejections in view of the following remarks.

The Office Action has indicated claim 24 as being both allowable and as not being allowable - Applicants respectfully request clarification on the status of claim 24.

Applicants' invention is directed to methods and system for encoding signals. As recited in claim 1, for example, a method of encoding a sequence of information bits in a communication system comprises: dividing said sequence of information bits into encoding bits

and parallel bits, encoding said encoding bits to produce encoded bits, mapping said encoded bits and said parallel bits into first and second pulse amplitude modulation (PAM) signals, and generating a quaternary amplitude modulation (QAM) signal from said first and said second PAM signals.

In rejecting this claim, the Office Action recognizes that Jin fails to expressly teach the step of *mapping said encoded bits and parallel bits into first and second pulse amplitude modulation (PAM) signals*. However, the Office Action relies on the background of Jin for teaching the similarity of a constellation encoder structure to that used in an ADSL system utilizing a quadrature amplitude modulation (QAM) and the use of turbo encoding in a DSL system. The Office action also relies upon the background of Paik (col. 1, lines 22-31) for teaching the use of a one-dimension PAM.

Jin is directed to a method of combining turbo encoding with trellis-coded modulation, as well as the associated decoding method, preferably, in a DMT system. Jin is not directed to mapping the bits (parallel and coded) to the symbols. The mapping of bits into symbols has a impacts decoding complexity and performance as well as the cost of implementation.

Paik is directed to a method of performing QAM TCM (Trellis Code Modulation) using available implementation components for QPSK (Quadrature Phase Shift Keying) TCM. In Paik, bits are split at the input of encoding (i.e. before encoding). Paik does not apply the concept of splitting combined coded and uncoded bits at the input of QAM mapping. The input to QAM mapping occurs after encoding.

Applicants' mapping method reduces decoding complexity while maintaining good performance. The mapping method breaks the bits into two sub sets where one-dimensional gray mapping is applied. At the decoding end, two dimensional QAM decoding can be broken into

two independent one-dimensional PAM decoding which leads to an order of magnitude of reduction in decoding complexity with little degradation of overall performance.

The teaching of Jin and Paik either taken alone or in combination fails to disclose *mapping said encoded bits and parallel bits into first and second pulse amplitude modulation (PAM) signals.*

At least for these reasons, it is believed that claim 1 is allowable over the teachings of Jin and Paik. Similarly, claim 27 is also allowable..

The remaining claims (i.e. claims 2, 3, 12, 15, 17, 20-23, 35, 39 and 42-26), all of which depend on one of independent and allowable claims 1 and 27 and cite additional advantages thereof, are also allowable.

All of the rejections having been overcome, it is respectfully submitted that this application is in condition for allowance and a notice to that effect is earnestly solicited. Should the Examiner have any questions with respect to expediting the prosecution of this application, he is urged to contact the undersigned at the number listed below.

Respectfully submitted,

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